ceding information, the *Nautical Almanac* gave, first for every day, and from 1861 for every two days, the ephemerides of all the planets for the time of their passing the meridian of Greenwich, information which French astronomers would have been happy to find in the *Connaissance des Temps* for the meridian of Paris. Let us add, moreover, that the positions of Neptune were only given in the *Connaissance des Temps* in 1861 (for 1863), while they were in the *Nautical Almanac* from 1857 (for 1861).

It was also in this same year, 1863, that the *Connaissance des Temps* gave for the first time the values of the constants of Bessel, intended to transform into apparent positions the mean positions of the stars given by the catalogues; as well as the elements of the occultations, according to Bessel, in a form which enabled voyagers to calculate, for the very place where they happened to be, the principal circumstances of the phenomena. The *Nautical Almanac* had published all this since 1834.

In 1864, the positions of the sun, which for many years were calculated with the tables of Delambre, reconstructed in part by M. Mathieu, were published according to the tables of M. Leverrier; the same was done for the positions of Mercury, and in the following year for those of Venus and Mars. The *Nautical Almanac* had used the tables of M. Leverrier since 1860 for the sun and Mercury (*Almanac* for 1864), since 1861 for Venus (*Almanac* for 1865), since 1862 for Mars (*Almanac* for 1866). On the other hand, the *Connaissance des Temps* for 1864 appeared in February 1863, and consequently six months after the *Nautical Almanac* for 1866. Finally, the *Connaissance des Temps* for 1864 contained the rectilinear co-ordinates of the sun referred to the plane of the equator; they are found in the *Nautical Almanac* from 1849.

This collection of reforms raised considerably the value of the *Connaissance des Temps*, which, it was unanimously agreed, had fallen very low as compared with foreign ephemerides. The reform accomplished in France in 1864 was analogous to that of the *Jahrbuch* in 1829 and of the *Nautical Almanac* in 1830. But even at the present time the *Connaissance des Temps* does not contain any ephemeris of Ceres, of Pallas, of Juno, nor of Vesta, which has appeared in the *Nautical Almanac* and the *Jahrbuch* since 1830; nor of any of the numerous small planets discovered since 1845, for which the other two works publish a supplement each year. Yet for a long time past the continued observation of these telescopic planets has formed one of the most important occupations of most of the observatories.

In 1870 the direction of the *Connaissance des Temps* passed into the hands of Puiseux, who, however, kept it for only a very short time. His period of office, nevertheless, was marked by an important improvement. He indicated, by a figure in the proper place, the day on which, in consequence of the difference of length between the sidereal day and the mean solar day, each star passed twice across the superior meridian of Paris. This was a sad omission; such an indication is found in the *Nautical Almanac* for 1822.

At present the direction of the *Connaissance des Temps* is entrusted to M. Lœwy; Mr. Hind has been superintendent of the *Nautical Almanac* Office since 1853, and Herr Fœrster succeeded, in 1864, the celebrated Encke in the direction of the *Jahrbuch* of Berlin.

TELEGRAPHING EXTRAORDINARY

AT the Telegraph Office, Washington, on Dec. 11, 1873, an experiment was carried out in the presence of Mr. Creswell, the Postmaster-General of the United States, the practical results of which will be of immense importance as regards the future of telegraphy throughout the world.

On that occasion the president's last annual message of 11,500 words was transmitted from Washington to New York, a distance of 290 miles, over a single wire in 22½ minutes, the speed obtained being over 2,500 letters per minute.

At New York the message was delivered from the automatic instrument printed in bold type in presence of the Postmaster of New York. This achievement in telegraphy is the more remarkable as the principle involved is not new, but was well known in 1848. The experiments made at that date were practically without result. By the new American combination of chemistry and mechanism the speed is apparently almost unlimited, messages at the rate of 1,200 words, or 6,000 letters, a minute being afterwards transmitted with equally satisfactory results.

Hitherto the speed attainable over circuits of similar length in this country by the Wheatstone automatic system, at present in use for the "high speed" service by the Postal Telegraph Department, does not exceed 200 letters a minute.

The new American instrument has a great advantage in the extreme simplicity of its construction, mechanical detail giving place to chemical action. One important result of this experiment is that it demonstrates that hitherto the speed of transmission of electric currents through a metallic conductor has been restricted from mechanical imperfections in the mechanism of the recording or receiving instrument, and that by the substitution of chemical decomposition for mechanical action, an almost unlimited speed of transmission may be obtained. It is to be hoped that this new transmitting and recording instrument may be the agent by which our present tariff of 1*s.* for twenty words, may be reduced to 6*d.*, or less, for a similar message. Scientific progress, practically applied, is an heirloom to a nation.

NOTES

MR. HENRY LONSDALE is preparing a biography of John Dalton, the great chemist, and would be glad of any letters or other aid in his important work.

AT the meeting of the Paris Academy of Sciences held on Monday, January 5, M. Fremy was elected president for the ensuing year, and MM. Chasles and Decaisne were elected to serve on the central committee.

A COMMITTEE, consisting of Lord Cathcart, Mr. C. Whitehead, Mr. Jabez Turner, Mr. Wakefield, Mr. Brandreth Gibbs, Mr. J. Bowen-Jones, Mr. W. Carruthers, F.L.S., and Mr. J. Algernon Clarke, appointed by the Royal Agricultural Society to carry into effect the suggestions of the judges of the potato disease essays held a meeting on Monday at Hanover Square. They will recommend the Council to offer three prizes of 100*l.* each for disease-proof potatoes. Competitors will probably be required to send in one ton of each variety by the middle of February. Each sample will be distributed among growers in many different parts of England, Wales, Scotland, and Ireland; and the produce of potatoes which resist disease during the first year's trial will be tested for two years longer. With a view of encouraging the production of new varieties, handsome prizes are to be offered also for disease-proof sorts raised from potato plums to enter into competition in the spring of 1879. The terms and conditions will be decided upon at the next meeting of the Council.

THE INDIAN MUSEUM, as it now stands, situated on the highest story of the India Office, has been found to be useless for all the purposes for which it was intended. It has therefore been resolved to erect on the plot of vacant ground in Charles-street, directly opposite the India Offices and facing St. James's Park, a new museum and public library. To this building, which will be very handsome and commodious, all the treasures exhibited in the present museum, as well as those now stowed away for want of space, will be removed. The public library and reading-room will form a marked feature in the new building, and will be constructed more especially with a view to the wants of those preparing for competition in the Indian Civil Service Examinations.

A STATEMENT, drawn up by the Council of the Trades Guild of Learning describes at great length the objects which are contemplated by the organisation. It states that its purpose is to provide education for workmen (1) in the sciences underlying their respective industries, and (2) in various branches of higher education; and that it has sprung spontaneously from the workmen of this country, and its responsible direction will devolve in the main on them, with the support of others who can undertake to advise and help in their educational work. It will accept of no aid from the State, but will make use of the National Universities as the best source of general education for the people of the great towns, enabling them to acquire, not only the results of scientific research, but the most thorough and scientific methods of teaching. By means of branches, which it proposes to establish in the large towns, it hopes to supply what is required to render the work already begun by the University of Cambridge continuous and permanent. It will endeavour to form local Boards, consisting mainly of workmen, who will be responsible for the preliminary formation of classes and the collection of the funds necessary in order to obtain University teaching.

DR. SMALLWOOD, one of the oldest meteorological observers in Canada, and Professor of Meteorology in McGill University, died on December 22. He had carried on observations for more than thirty years; in the first instance at St. Martin's, and afterwards, under the auspices of McGill University and the Canadian Government, in Montreal.

THE Geological Parties of the Canadian Geological Survey and the Boundary Commission have now returned from the West, bringing much material of scientific interest. One of the most important practical results appears to be the establishment of the existence of very large and valuable beds of coal and lignite in various parts of the Canadian territory, between Red River and the Rocky Mountains. This must greatly promote the settlement of these territories and the extension of railway communication into them.

THE *XIX*^{e}. *Siècle* announces that one of the most distinguished officers of the French navy, as well as an eminent explorer, M. F. Garnier, has been assassinated by the Chinese rebels of Tonquin. It would appear that M. Garnier was in the month of November last engaged in an expedition in Tonquin, his object being to enforce the treaties by expelling from the country a Frenchman who had supplied arms to the people of Yun-nan. M. Garnier had captured a town and made prisoners, who are now on their way to France. It is possible that he fell in a subsequent engagement, but the telegram distinctly states that he was assassinated. On this point full details are expected to arrive on the 18th or 20th inst. M. Garnier was only 35 years of age, having been born at St. Etienne on July 25, 1839. Appointed a midshipman in 1860, he was attached in the same year to the staff of Admiral Charner, and in that capacity he made the campaigns of China and Cochin China. Three years later he was appointed Inspector of Native Affairs, and soon afterwards he published a pamphlet in which he propounded an elaborate scheme for an exploring expedition into the interior of Indo-China, with a view to the opening up of commercial communications between Southern China and the French possessions. M. de Chasseloup, at that time Minister of Marine, nominated a scientific commission to carry out this expedition, the importance of which he fully appreciated. On June 5, 1866, an expedition, under the command of Capt. de Lagrée, and comprising among other officers Lieut. Garnier, left Saigon, went up the river Me-Kong, explored Indo-China, and proceeded as far as Yunnan. After the death of his chief, Lieut. Garnier assumed the command of the expedition, which he brought back to Saigon, along the Blue River. This voyage of exploration, one of the most important which has been accomplished in the present century, occupied two years and a few days. The death of this young and intrepid traveller is an irreparable loss for France and for the whole scientific world.

LAST Thursday, Sir Bartle Frere, speaking at Glasgow on Dr. Livingstone, said that he was often asked what benefit and practical result he expects from Dr. Livingstone's labours. "I answer," Sir Bartle Frere said, "that the geographical problems alone which he will have solved must exceed in importance and interest those of any other explorer since the days of Columbus. But apart from all questions of geographical science, I believe that the commercial, political, and moral consequences must prove far more important than anything of the kind which has been effected since the discovery of the New World."

THE members of the Cambridge Natural Science Club concluded their fifth series of meetings on Saturday, December 6. Each member in turn brings some subject of scientific interest before the notice of the club, in the form of a paper or otherwise, and the discussions which follow have been in many cases both lively and prolonged. The following subjects were discussed during the October Term, 1873:—"Mechanics in Nature," by Mr. A. F. Buxton (Trin. Coll.); "Zoological Colonies," by Mr. A. J. Jukes Browne (St. John's Coll.); "The Magnetism of Crystals," by Mr. J. E. H. Gordon (Caius Coll.); "Some Transformations of Energy," by Mr. C. T. Whitmell, B.A. (Trin. Coll.); "The Neocomian Strata," by Mr. J. J. H. Teall, B.A. (St. John's Coll.); "Cone in Cone-structure in the Lower Silurian Rocks," by Mr. R. D. Roberts (Clare Coll.); and a paper on "The Continuity of the Chalk," read by Mr. P. H. Carpenter.

IN the last number of the *Journal* of the Scottish Meteorological Society is a paper by Prof. Mohn on "Certain Effects of Currents on the Temperature of the Sea and Air," of which the following are the results:—1. That the surface of the sea in currents in narrow sounds in summer is colder than in neighbouring places, where there is a wider sheet of water. 2. That an effect of the reverse kind takes place in winter, but in a much smaller degree. 3. That both effects together diminish the yearly range of the temperature of the surface of the sea. 4. That these circumstances influence the temperature of the air in the same direction at such places, and that hereby a part of the anomalous, strongly-marked oceanic character which places in such situations exhibit, is accounted for. Other papers in this number are—"Letter on some Meteorological Questions requiring Investigation," from Mr. Robert Tennent; and a valuable paper on "Atmospheric Ozone and its Sources," by Dr. T. Moffat.

MESSRS. MACMILLAN have issued a cheap "Special Edition for Schools," of Edward Clodd's "Childhood of the World," in the style of the "Science Primers."

THE Meteorological Committee of the Royal Society have considered Mr. Meldrum's "Notes on the form of Cyclones in the Southern Indian Ocean, and on some of the rules given for avoiding their Centres," of so much practical importance, that they have thought it right to print and circulate it in a separate form as a non-official paper.

WE can do little more than name the following books which have been sent us:—Professor Blackie's neat little volume "On

Self-Culture, Intellectual, Moral, and Physical, a Vade-mecum for Young Men and Students" (Edinburgh: Edmonston and Douglas), contains many old and valuable truths forcibly expressed, and is calculated, we believe, to benefit the class for whom it is intended.—"Darwinism and Design; or, Creation by Evolution" (Hodder and Stoughton), is an attempt to show that although "Evolution is true, the Design argument remains unshaken;" that indeed "Evolution is the method of Creation."—"From January to December; a book for Children" (Longmans), is a miscellany consisting of stories, poems, papers on natural history, &c., arranged, for no reason that we can see, under the twelve months of the year. We fear even grown-up children will find the visits to Kew, the Zoological Gardens, and other papers, dull; besides, it is a great blunder to send forth a book like this without a single illustration.—"The Alps of Arabia; Travels in Egypt, Sinai, Arabia, and the Holy Land," by William Charles Vaughan (King and Co.), goes over well-trodden ground, and tells us nothing new; though those who contemplate a similar journey will find the book useful, fresh, and interesting.—"The Expanse of Heaven; a Series of Essays on the Wonders of the Firmament," by R. A. Proctor, B.A. (King and Co.), is sufficiently described by its title.

"GEOLOGICAL Sketch of the Province of Cadiz," by J. McPherson, is an abstract of a similar work written by the author in Spanish, and is printed at Cadiz. It is a valuable study of the subject, and is illustrated by well-executed maps and sections.

WE take the following from *Ocean Highways*:—Captain Heaviside, R.E., of the Great Trigonometrical Survey of India, is completing the work of Captain Basevi by forming a base station for the India pendulum operations, at the Kew Observatory. With this object he is now engaged in swinging Captain Kater's original convertible pendulum; and a re-measurement of its length will be undertaken probably at the Ordnance Survey Office at Southampton, by Colonel Clarke, the highest authority in England, and probably in Europe, as regards the measurement of standards.

THE Dublin College of Physicians, the *Lancet* says, has opened its portals to female aspirants for its degrees, a lady holding the M.D. of Zurich having been exempted from the first half of the examination for the L.K.Q.C.P. The College is also said to be willing to confer its midwifery diploma on all ladies who may, under certain regulations, apply for it.

WE have received an Italian publication by A. Manzone, on the fossils of Monte Titano in the republic of San Marino, their age and mode of origin. It is published at Florence by G. Barbèra.

THE principal papers in the last number of Petermann's *Mittheilungen* are, a Memoir of Colonel Eemel von Sydow a long account, by Prof. Nordenskiöld, of the Swedish Expedition to the North-east of Spitzbergen, from April 24 to June 15, of last year, an account of the Exploration of North-west Texas, by an expedition sent out in 1872 by the Texas Land and Copper Association, and a summary of the work of the *Challenger* Expedition in the North Atlantic. The last two are illustrated by well-executed maps.

THE additions to the Zoological Society Gardens during the past week include a Lioness (*Felis leo*) from Kattywar, presented by Mr. J. Humfrey, of the Bombay Staff Corps; three common Marmosets (*Hepale jacchus*) from S.E. Brazil, presented by Le Chevalier d'Albuquerque; a Crested Ground Parrakeet (*Calopsitta novæ-hollandiæ*) from Australia, presented by Vice-Admiral Wallis Houston; and a Drill (*Cynocephalus cucophœus*) from W. Africa, purchased.

SCIENTIFIC SERIALS

The Monthly Microscopical Journal, for this month, contains four papers, besides the notes, record of the progress of Microscopical Science and the Proceedings of the Royal Microscopical Society.—Mr. S. J. McIntire, in Notes on so-called *Acarellus*, discusses the point whether the specimens described and named *A. muscæ* and *A. pulicis*, by Mr. Tatem, are related to a form known by him as a parasite on *Obisium*, and elsewhere; and whether it is one of the early forms of *Gamasus*, as thought by Mr. Tatem and Dujardin, though not by himself.—A second paper by Mr. W. H. Dallinger and Dr. J. Drysdale, contains further researches into the life-history of the Monads. The importance of prolonged study of the same form is insisted on, and this shows that the method of multiplication is not, as generally supposed, entirely by fission, but sometimes by an absorption into one of two individuals, the resulting mass clearing like an ovum, and giving rise, somewhat as in *Gregarina*, to a multitude of new individuals. Sometimes more than two, as many as four or six, were observed to unite.—Prof. E. Hull describes the microscopic structure of a granitoid quartz-porphyry from Galway, in which "the silica has consolidated into individual sub-crystalline grains before the other minerals, whereas in all true granites the silica has been the last to consolidate. The presence of aqueous (?) vapour during the consolidation of this rock is shown by the existence of numerous fluid cavities, and is another feature in which it resembles true granites."—Mr. G. W. Morehouse's paper on the structure of the scales of *Lepisma saccharina*, is reprinted from the *American Naturalist.*

Poggendorff's Annalen der Physik und Chemie, No. 8, 1873.—In this number, M. Riess criticises four different methods for determining the duration of discharge of a Leyden battery; that of Wheatstone, with rotating mirror; that of Lucas and Cazin, with rotating slitted disc; the electrical thermometer; and the electro-dynamometer. He shows, from experiments with the first two, that the light-duration of the spark consists of two time-parts; the discharge-time of the battery, and the duration of the after-glow of particles of metal present in the spark. These two parts vary, sometimes in the same direction, sometimes in opposite directions. Thus the duration of the discharge and the luminous duration of the discharge-spark stand in no fixed relation to each other.—In a paper on polarisation of electrodes in the voltaic arc, M. Herwig obtains results different from those of Grove on the same subject. His final mode of experiment was with a ball of pure silver as one electrode, and a plate of copper as the other; the ball being moved from point to point over the plate. Only the silver was here pulverised and any repeated action on what of it passed to the plate was prevented. M. Herwig found that the waste of silver was not even remotely equivalent to the quantity of hydrogen developed in the voltameter.—Dr. Rink has a paper on the velocity of sound, in which he raises some objections to the conclusion to which M. Regnault was led by experiments with the gas and water pipes of Paris, viz., that the velocity of sound is dependent on its intensity, and that a weak wave is propagated less quickly than a strong one.—A lengthy article by M. Riecke treats of the magnetisation of soft iron. He gives experimental determinations of the functions of magnetisation for different kinds of iron (by which is meant the induced magnetic moment divided by the magnetising force).—In a note on the relations between capillary and electric phenomena, M. G. Lippmann describes a capillary electrometer and an electro-capillary motor (with illustrations). In the latter, two bundles of fine glass tubes, dipping in separate vessels of mercury, are moved up and down alternately through the changes of form the mercury surface undergoes from polarisation with a galvanic current; and this motion is converted into rotary by a system of levers.—M. Bergh proposes an application of solar heat as a motor force,—vaporising sulphurous acid contained in vessels on the roof of a workshop. He would add to the solar machine, Natterer's apparatus for condensing carbonic acid; the force thus stored up might be used when solar heat was deficient.—M. Leyser describes a new form of Holtz's machine; and among the remaining subjects treated in this number are, heat relations and decompositions in solution of mixed salts in water (Winckelmann), absorption of heat by pulverised carbon (Vierordt), determination of the relation of specific heat to the velocity of cooling of certain gases(Kohlrausch).